Claims

I claim:

1   1. An apparatus for detecting a transmitted data symbol in an ultra-wide-

2   bandwidth communications system, comprising:

3   a filter matched to a received reference signal and data signal

4   corresponding to the transmitted data symbol;

5   a delay block connected to an output of the filter;

6   a multiplier connected to an output of the delay block and an output of

7   the filter;

8   an integrator connected to an output of the multiplier; and

9   decision means for selecting a largest output of the integrator to

10   provide a basic building block of an ultra-wide-bandwidth the receiver to

11   detect a received data symbol corresponding to the transmitted data symbol.

1   2. The apparatus of claim 1, in which a conjugate block is connected at a

2   branch between the filter and the multiplier.

1   3. The apparatus of claim 1, in which the data symbol is pulse position

2   modulated.

1   4. The apparatus of claim 1, in which the data symbol is pulse amplitude

2   modulated.

1   5. The apparatus of claim 1, in which the data symbol is pulse phase

2   modulated.

1   6. The apparatus of claim 1, in which the delay block time-aligns the

2   reference signal with a filtered data signal.

1   7. The apparatus of claim 1, in which a plurality of data signals are

2   processed in parallel for each reference signal corresponding to one data

3   symbol.

1   8. The apparatus of claim 1, in which the data symbol is transmitted to the

2   receiver by on-off keying.

1   9. The apparatus of claim 1, in which the filter is matched to alternatives of

2   the data symbol.

1   10. The apparatus of claim 1, in which the filter is constructed as a matched

2   filter bank.

1   11. The apparatus of claim 1, in which the output of the multiplier is

2   integrated over a finite interval determined by an excess delay and signal

3   duration to achieve a maximum signal-to-noise ratio.

1   12. The apparatus of claim 1, in which a plurality of differently modulated

2   data signals are transmitted successively for each reference signal

3   corresponding to one data symbol.

1   13. The apparatus of claim 1, in which a plurality of basic building blocks

2   are interconnected by connecting the delay block to the multiplier of a

3   previous basic building block via the conjugate block.

1   14. The apparatus of claim 1, in which a plurality of basic building blocks

2   are interconnected by connecting the filter to the multiplier of a previous

3   basic building block via the conjugate block.

1   15. The apparatus of claim 1 further comprising:

2   an equalizer connected to the output of the integrator to reduce inter-

3   symbol-interference.

1   16. A method for detecting a transmitted data symbol in an ultra-wide-

2   bandwidth communications system, comprising:

3   filtering a received reference signal and data signal;

4   delaying the filtered reference signal to time-align with the filtered

5   data signal;

6   multiplying the filtered data signal by the delayed reference signal to

7   produce a product;

8   integrating the product over time;

9   selecting a largest output of the integrator to provide a basic building

10   block of an ultra-wide-bandwidth the receiver to detect a received data

11   symbol corresponding to the transmitted data symbol.